EPA Region 7 TMDL Review

TMDL ID: KS-MO-11-LM042401 **State:** KS
Document Name: WYANDOTTE COUNTY LAKE

Basin(s): MISSOURI
HUC(s): 10240011
Water body(ies): WYANDOTTE COUNTY LAKE
Tributary(ies):
Pollutant(s): EUTROPHICATION

Submittal Date: 9/5/2007 **Approved:** Yes

Submittal Letter

State submittal letter indicates final Total Maximum Daily Load(s) (TMDL) for specific pollutant(s)/water(s) were adopted by the state, and submitted to EPA for approval under section 303(d) of the Clean Water Act [40 CFR § 130.7(c)(1)]. Include date submitted letter was received by EPA, date of receipt of any revisions, and the date of original approval if submittal is a phase II TMDL.

The TMDL, public comments and KDHE's response to those comments for Wyandotte County Lake was formally submitted by the Kansas Department of Health and Environment (KDHE) in a letter received by the United States Environmental Protection Agency (EPA) on September 5, 2007.

Water Quality Standards Attainment

The water body's loading capacity (LC) for the applicable pollutant is identified and the rationale for the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources is described. TMDL and associated allocations are set at levels adequate to result in attainment of applicable water quality standards (WQS) [40 CFR § 130.7(c)(1)]. A statement that WQS will be attained is made.

The LC was established through a simplified version of the Bathtub model, referred to as the CNET model. The CNET model utilizes three and eight empirical models to predict levels of chlorophyll-a (Chl-a) and total phosphorus (TP), respectively. This model worked well for the Wyandotte County Lake due to the potential of strong algal response to phosphorus input that is determined by the lake's low levels of inorganic turbidity and high light availability in the mixed layer. The lake is relatively deep with a very long hydrological residence time. The lake's depth has a negative impact on the sedimentation rates of phosphorus in the lake, thus resulting in higher TP concentrations in the water.

To address the identified pollutant, a Chl-a concentration of 10 ug/L will be achieved to prevent further deterioration and reverse the trend in water quality, in addition to providing a safety buffer from uncertainties in loads and water quality management. This a more stringent target than the normal 12 ug/L used by the state for primary contact recreation use. This target was also used to show the linkage between TP and total nitrogen (TN). In-lake average concentrations of TP should be 22 ug/L (ppb) with a maximum level at 27 ug/L (ppb). A corroborating endpoint of average Secchi disk depth greater than 1.6 meters (m) will also be used to assess the aesthetic quality of the lake for recreation. The LC targeted to meet this goal is 1205 lbs/yr of TP (6.27 lbs/day).

The desired endpoint of this TMDL will be refined based on additional monitoring and evaluation. Loads within the loading capacity of the lake, water quality standards attainment and full support of the designated uses will be achieved upon attainment of the endpoints.

EPA agrees that attainment of the LCs should result in the attainment of WQS.

Numeric Target(s)

Submittal describes applicable WQS, including beneficial uses, applicable numeric and/or narrative criteria. If the TMDL is based on a target other than a numeric water quality criterion, then a numeric expression, site specific if possible, was developed from a narrative criterion and a description of the process used to derive the target is included in the submittal.

Designated Uses:

Primary Contact Recreation
Expected Aquatic Life Use
Food Procurement Use

WQS:

Nutrients- Narrative: The introduction of plant nutrients into streams, lakes and wetlands from artificial sources shall be controlled to prevent the accelerated succession or replacement of aquatic biota or the production of undesirable quantities or kinds of aquatic life. (KAR 28-16-28e(c)(2)(B)).

The introduction of plant nutrients into surface waters designated for primary or secondary contact recreational use shall be controlled to prevent the development of objectionable concentrations of algae or algal by-products or nuisance growths of submersed, floating, or emergent aquatic vegetation. (KAR-28-16-28e(c)(7)(A)).

The State of Kansas does not have numeric criterion for nutrients or suspended solids in their WQS.

Eutrophication:

Chl-a water quality translator for Primary Contact Recreation is 10 ug/L Chl-a, that incorporates a 2ug/L MOS.

The current conditions show the average TN and TP concentrations are 0.297 mgN/L and 0.022 mg/L, respectively. The Chl-a average is 8.4 ug/L, ranging from 5.1 ug/L in 1988 to 12.3 ug/L in 2001. The Secchi depth is averaged around 1.6 meters (5.2 feet). According to the listed average values, Wyandotte County Lake is overall a good quality lake with good clarity in the water. The primary concern for the lake is the increasing levels of Chl-a and the corresponding Trophic State Indices described in Figures 2 and 3 of the TMDL.

The lake has low levels of inorganic turbidity (silt/clay), high light availability in the mixed layer, and potential high response of algae community to increases in nutrient levels. Wyandotte County Lake is likely to be either phosphorus limited or phosphorus and nitrogen co-limited.

The submittal states that all uses are impaired by eutrophication.

Pollutant(s) of concern

An explanation and analytical basis for expressing the TMDL through surrogate measures (e.g., parameters such as percent fines and turbidity for sediment impairments, or chlorophyll-a and phosphorus loadings for excess algae) is provided, if applicable. For each identified pollutant, the submittal describes analytical basis for conclusions, allocations and margin of safety (MOS) that do not exceed the LC. If submittal is a phase II TMDL there are refined relationships linking the load to WQS attainment. If there is an increase in the TMDL there is a refined relationship specified to validate the increase in TMDL (either load allocation (LA) or waste load allocation (WLA)). This section will compare and validate the change in targeted load between the versions.

Numeric targets for TN and TP were derived through the use of the CNET model. The model targets Chl-a concentration of 10 ug/L to achieve the required TN and TP concentration in the lake.

The submittal establishes a Chl-a target of 10 ug/L as a surrogate numeric criterion for the narrative standards dealing with eutrophication.

Source Analysis

Important assumptions made in developing the TMDL, such as assumed distribution of land use in the watershed, population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources, are described. Point, nonpoint and background sources of pollutants of concern are described, including magnitude and location of the sources. Submittal demonstrates all

significant sources have been considered. If this is a phase II TMDL any new sources or removed sources will be specified and explained.

The location of the drainage area or watershed for the Wyandotte County Lake is located within the municipal boundary of Kansas City, Kansas. The probable sources for impairment are runoff, leaky septic systems, animal waste runoff, as well as infiltration through soil and groundwater. The lake itself is a part of the Wyandotte County Lake Park and is surrounded mainly by forest. The watershed is contiguous to the Kansas Speedway, Cabela's and Nebraska Furniture Mart. These businesses are located within a rapidly developing area. Data has shown that the watershed underwent urban development from 1992 to 2001. A decrease in forest land took place both in 1992 and 2001, causing an increase in urban land development from 16.9% in 1992 to 20.7% in 2001. Urbanization tends to produce an enhancement in runoff, nutrients, and sediment loads to the ecosystem due to increases of impervious areas in the watershed. The boost of Chl-a levels in Wyandotte County Lake is a likely result of the initial degradation of the lake's ecosystem as a consequence of the rapid development. Without extenuating measures the watershed and ecosystem will become more polluted and degrade over time.

A probable source in the increase of nutrient input to the lake is the Woodlands Racetrack located at the southwest corner of Wyandotte County State Fishing Lake. Domestic sewage and animal waste from the kennel were discharged into the Kansas City sanitary sewer system. Dry waste was also collected from the exercise area of each kennel and disposed at the Deffenbaugh Johnson County Landfill. These facts are according to a 1991 inspection report of the Racetrack, thus proposing a concern of nitrogen buildup in the soils underlying the exercise areas.This could result in groundwater pollution. KDHE determined that a permit was not required from the Woodlands because the facility did not pose a potential for surface water pollution.

Stormwater runoff from the facility and the parking lot poses a likely source of eutrophication to this lake due to the containment of high levels of sediment and nutrients. The runoff from the racetrack flows into Bennet Lake, discharges and overflows into Wyandotte County Lake which is located a half mile from Bennet Lake.

The use of septic systems on the east side of the lake by older residential homes and in the Wyandotte County Lake raises yet another source of concern, as well as the wild goose population in the park area. The wild goose population was very high a few years ago; in 2003 goose feeding was banned. The goose population has been under control as a result of this enforcement. The trophic state in the lake may stem either from waste deposits of the geese or from improper disposal by private boats on the lake in addition to other runoff.

EPA agrees the submittal considers all known significant sources.

Allocation - Loading Capacity

Submittal identifies appropriate WLA for point, and load allocations for nonpoint sources. If no point sources are present the WLA is stated as zero. If no nonpoint sources are present, the LA is stated as zero [40 CFR § 130.2 (i)]. If this is a phase II TMDL the change in LC will be documented in this section.

A TMDL is defined as:

$$TMDL = LC = WLA + Background + MOS + LA$$

The LC for Wyandotte County Lake is 1205 lbs/yr for TP or 6.27 lbs/day. The TMDL established a WLA of 260 lbs of TP/year (1.35 lbs/day). The atmospheric deposition of TP is 165 lbs/year, or 0.86 lbs/day. The LA for other non point sources is 75% of the Goal Load or 780 lbs/year converting to 4.06 lbs/day.

The Technical Support Document for Water Quality-based Toxics Control (EPA/505/2-90-001.) was used in this TMDL to translate the long term averages to maximum daily values. The Maximum Daily Load (MDL) equals the Long Term Average (LTA) * exp (z* sigma-0.5*sigma^2.) Sediment, nitrogen, and phosphorus are expected to have large coefficients of variation (CV).

A statement is presented in the TMDL expressing that the growing season mean target is more correctly determined by nutrient loading on an annual basis because of the way a lake functions ecologically.

WLA Comment

Submittal lists individual WLAs for each identified point source [40 CFR § 130.2(h)]. If a WLA is not assigned it

must be shown that the discharge does not cause or contribute to WQS excursions, the source is contained in a general permit addressed by the TMDL, or extenuating circumstances exist which prevent assignment of individual WLAs. Any such exceptions must be explained to a satisfactory degree. If a WLA of zero is assigned to any facility it must be stated as such [40 CFR § 130.2(i)]. If this is a phase II TMDL any differences in phase I and phase II WLAs will be documented in this section.

The WLA for stormwater will be 260 lbs of TP/year, or 1.35 lbs/day, thus reflecting the current and potential proportion of developed land (25%) in the watershed. The Phase I National Pollution Discharge Elimination System (NPDES) stormwater permit of the Unified Government of Wyandotte County, Kansas City, Kansas will directly control practices for developing land in the watershed, including the Woodlands Racetrack.

There are no other permitted point sources (NPDES or Confined Animal Feeding Operation - CAFO) in the watershed.

EPA agrees this is an appropriate WLA.

LA Comment

Includes all nonpoint sources loads, natural background, and potential for future growth. If no nonpoint sources are identified the LA must be given as zero [40 CFR § 130.2(g)]. If this is a phase II TMDL any differences in phase I and phase II LAs will be documented in this section.

The likely nonpoint sources considered in this TMDL are non MS4 runoff, leaky septic systems, animal waste runoff and infiltration through soil and groundwater. The LA of this TMDL is divided into atmospheric deposition and other non-point sources. These factors are considered main contributors to the nutrient input and impairment of Wyandotte County Lake. An approximation of the atmospheric deposition of TP is 165 lbs/year converting to 0.86 lbs/day. The LA for other non-point sources is 75% of the Goal Load or 780 lbs/year, converting to 4.06 lbs/year. In conclusion, a total LA of 4.92 lbs/day will be produced and a 14% nutrient reduction is required from the current watershed conditions.

EPA agrees this is an appropriate LA.

Margin of Safety

Submittal describes explicit and/or implicit MOS for each pollutant [40 CFR § 130.7(c)(1)]. If the MOS is implicit, the conservative assumptions in the analysis for the MOS are described. If the MOS is explicit, the loadings set aside for the MOS are identified and a rationale for selecting the value for the MOS is provided. If this is a phase II TMDL any differences in MOS will be documented in this section.

The MOS is implicitly set. The goal of 10ug/L Chl-a is more stringent than the target (12ug/L) normally used by the state in lake eutrophication issues, thus providing a safety buffer for the lake from the uncertainties in loads and water quality management. This goal was established to prevent the further deterioration and reverse in the trend of water quality.

EPA agrees this is an appropriate MOS.

Seasonal Variation and Critical Conditions

Submittal describes the method for accounting for seasonal variation and critical conditions in the TMDL(s) [40 CFR § 130.7(c)(1)]. Critical conditions are factors such as flow or temperature which may lead to the excursion of WQS. If this is a phase II TMDL any differences in conditions will be documented in this section.

Seasonal variation has been incorporated into this TMDL due to peaks of algal growth likely to occur during the summer months. Lake stratification takes place during the summer months and all samples collected were during the months of June and August. Collected samples were greatly influenced by local weather conditions such as wind and temperature. The depths of the epilimnion (the layer of focus for this TMDL) ranged from 2-6 m on the sampling dates.

Seasonality and any critical conditions have been addressed in the submittal.

Public Participation

Submittal describes required public notice and public comment opportunity, and explains how the public

comments were considered in the final TMDL(s) [40 CFR § 130.7(c)(1)(ii)].

Public meetings to discuss TMDLs in the Missouri Basin have been held since 2001. An active internet Web Site was established at www.kdheks.gov/tmdl/ to convey information to the public on the general establishment of TMDLs in the Missouri Basin and these specific TMDLs. The TMDL was available from June 2007 through August 2007.

A public hearing was held in Hiawatha on May 30, 2007, to discuss Missouri Basin TMDLs.

The Missouri Advisory Committee met to discuss these TMDLs on June 26, 2006 in Atchison, December 1, 2006 and January 26, 2007, in Highland, March 16, 2007, in Atchison and May14, 2007, in Hiawatha.

Comments were received from EPA on the public notice version of the Wyandotte County Lake TMDL. The comments were addressed satisfactorily in the submittal.

EPA agrees the TMDL received the opportunity for meaningful public input.

Monitoring Plan for TMDL(s) Under Phased Approach

The TMDL identifies a monitoring plan that describes the additional data to be collected to determine if the load reductions required by the TMDL lead to attainment of WQS, and a schedule for considering revisions to the TMDL(s) (where phased approach is used) [40 CFR § 130.7].

KDHE will continue its 3-yr sampling schedule in order to assess the impairment that drives this TMDL. The status for implementation priority status of this TMDL will be based on this sampling and evaluated in 2012. Should an impaired status remain, the desired allocations under this TMDL will be refined and more intensive sampling will need to be conducted over the period of 2012-2015 to assess progress in this TMDL's implementation.

Reasonable Assurance

Reasonable assurance only applies when less stringent WLAs are assigned based on the assumption of nonpoint source reductions in the LA will be met [40 CFR § 130.2(i)]. This section can also contain statements made by the state concerning the state's authority to control pollutant loads.

Reasonable assurances are not required for this TMDL because facilities' WLAs are set to meet WQS. Kansas has identified several Federal, state, local and non-government organizations that may be included in the implementation process, as well enforced and compliance measures as needed for the NDPES permits.